

Reply to Office Action of June 27 2005  
Amendment Dated: December 20, 2005

Appl. No.: 09/785,884  
Attorney Docket No.: CSCO-002/94701

**Listing of Claims**

1       Claim 1 (Currently Amended) A method of processing a plurality of keep-alive  
2 messages generated by a corresponding plurality of end systems, each of said plurality of  
3 keep-alive messages being designed to request the status of a corresponding point to point  
4 (PPP) session implemented on a communication network, said method comprising:

5           receiving in an aggregation device said plurality of keep-alive messages;

6           generating in said aggregation device an aggregated request packet which indicates  
7 that the status of said PPP sessions is requested; and

8           sending said aggregated request packet on said communication network to a peer  
9 aggregation device,

10           wherein said receiving, said generating and said sending are performed in an  
11 aggregation device implemented as a single device.

1       Claim 2 (Original) The method of claim 1, further comprising:

2           receiving said aggregated request packet in said peer aggregation device;

3           indicating the status of said plurality of sessions in an aggregated reply packet; and  
4 sending said aggregated reply packet to said aggregation device.

1       Claim 3 (Original) The method of claim 1, further comprising receiving in said  
2 aggregation device an aggregated reply packet from said peer aggregation device, wherein  
3 said aggregated reply packet indicates the status of at least some of said plurality of PPP  
4 sessions.

1       Claim 4 (Previously Amended) The method of claim 3, further comprising sending  
2 from said aggregation device a proxy keep-alive reply message to one of said plurality of end  
3 systems originating a corresponding one of said keep alive-messages without waiting for said  
4 aggregated reply packet.

1       Claim 5 (Original) The method of claim 4, further comprising:

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2 maintaining a remote status table in said aggregation device, wherein said remote  
3 status table indicates the status of sessions supported by said aggregation device;  
4 updating said remote status table with the information in said aggregated reply  
5 packet; and  
6 generating said proxy keep-alive reply according to said remote status table.

1 Claim 6 (Original) The method of claim 5, wherein said proxy keep-alive message  
2 indicates that the corresponding session is alive/OK when a first keep-alive message is  
3 received for the corresponding session.

1 Claim 7 (Original) The method of claim 6, further comprising initializing the status  
2 of each of said session to alive/OK such that said proxy keep-alive message in response to  
3 said first keep-alive message indicates alive/OK status.

1 Claim 8 (Original) The method of claim 1, wherein said communication network is  
2 implemented using one of frame relay, ATM and IP networks.

1 Claim 9 (Original) The method of claim 1, wherein said aggregation device is one of  
2 a network access server and home gateway.

1 Claim 10 (Currently Amended): A method of processing an aggregated request packet  
2 in an aggregation device, wherein said aggregated request packet indicates that the status of  
3 a plurality of point-to-point sessions are requested, said method comprising:

4 examining said aggregated request packet to determine said plurality of point-to-point  
5 sessions;  
6 determining the status of each of said plurality of point-to-point sessions;  
7 generating an aggregated reply packet indicating the status of said plurality of point-  
8 to-point sessions; and  
9 sending said aggregated reply packet to said peer aggregation device,

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10       wherein said examining, said determining, said generating and said sending are  
11       performed in said aggregation device implemented as a single device.

1           Claim 11 (Original) The method of claim 10, wherein said determining comprises  
2       accessing a local status table which contains the status information of at least some of said  
3       plurality of point-to-point sessions.

1           Claim 12 (Original) The method of claim 10, wherein said generating comprises  
2       including a client magic number associated with each of said plurality of point-to-point  
3       sessions.

1           Claim 13 (Original) The method of claim 10, wherein said generating comprises  
2       setting a bit to one logical value to indicate that a corresponding one of said plurality of  
3       sessions is OK/alive, and to another logical value to indicate that said corresponding one  
4       of said plurality of session not OK/alive.

1           Claim 14 (Original) The method of claim 10, wherein said aggregation device  
2       comprises one of a network access server (NAS) and a home gateway implemented in a  
3       communication network.

1           Claim 15 (Currently Amended): An aggregation device for processing a plurality  
2       of keep-alive messages generated by a corresponding plurality of end systems, each of said  
3       plurality of keep-alive messages being designed to request the status of a corresponding  
4       point to point (PPP) session implemented on a communication network, said aggregation  
5       device comprising:

6           an input interface receiving said plurality of keep-alive messages;  
7           a message aggregator coupled to said input interface, said message aggregator  
8       examining said plurality of messages and generating data according to a format indicating  
9       that the status of said PPP sessions is requested, wherein said message aggregator includes

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10        fewer bits in said data than the sum of data forming said plurality of keep-alive messages  
11        together; and

12            an output interface sending an aggregated request packet on said communication  
13          network to a peer aggregation device, said aggregated request packet containing said data  
14          generated by said message aggregator.

1            Claim 16 (Original) The aggregation device of claim 15, further comprising an  
2          encapsulator encapsulating said data in a packet suitable for transmission on said  
3          communication network.

1            Claim 17 (Original) The aggregation device of claim 16, further comprising:  
2            a remote status table indicating the status of sessions supported by said aggregation  
3          device; and

4            a de-aggregator receiving an aggregated reply packet from said peer aggregation  
5          device, wherein said aggregated reply packet indicates the status of at least some of said  
6          plurality of PPP sessions, said de-aggregator updating said remote status table with the  
7          information in said aggregated reply packet.

1            Claim 18 (Original) The aggregation device of claim 17, further comprising a proxy  
2          reply unit sending a proxy keep-alive reply message to one of said plurality of end systems  
3          originating a corresponding one of said keep alive-messages without waiting for said  
4          aggregated reply packet.

1            Claim 19 (Original) The invention of claim 18, wherein said aggregation device  
2          comprises a network access server.

1            Claim 20 (Original) The aggregation device of claim 18, wherein said aggregated  
2          request packet contains a magic number related to each of the corresponding sessions.

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1       Claim 21 (Original) An aggregation device for processing a plurality of keep-alive  
2 messages generated by a corresponding plurality of end systems, each of said plurality of  
3 keep-alive messages being designed to request the status of a corresponding point to point  
4 (PPP) session implemented on a communication network, said aggregation device  
5 comprising:

6           first means for receiving said plurality of keep-alive messages;

7           means for generating an aggregated request packet which indicates that the status  
8 of said PPP sessions is requested; and

9           means for sending said aggregated request packet on said communication network  
10 to a peer aggregation device,

11           wherein said means for receiving, said means for generating and said means for  
12 sending are contained in said aggregation device implemented as a single device.

1       Claim 22 (Original) The aggregation device of claim 21, further comprising second  
2 means for receiving an aggregated reply packet from said peer aggregation device, wherein  
3 said aggregated reply packet indicates the status of at least some of said plurality of PPP  
4 sessions.

1       Claim 23 (Original) The aggregation device of claim 22, further comprising means  
2 for sending a proxy keep-alive reply message to one of said plurality of end systems  
3 originating a corresponding one of said keep alive-messages without waiting for said  
4 aggregated reply packet.

1       Claim 24 (Original) The aggregation device of claim 23, further comprising:  
2           means for maintaining a remote status table in said aggregation device, wherein said  
3 remote status table indicates the status of sessions supported by said aggregation device;  
4           means for updating said remote status table with the information in said aggregated  
5 reply packet; and  
6           means for generating said proxy keep-alive reply according to said remote status  
7 table.

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1       Claim 25 (Original) An aggregation device for processing an aggregated request  
2    packet, wherein said aggregated request packet indicates that the status of a plurality of  
3    point-to-point sessions are requested, said aggregation device comprising:

4       means for examining said aggregated request packet to determine said plurality of  
5    point-to-point sessions;

6       means for determining the status of each of said plurality of point-to-point sessions;  
7       means for generating an aggregated reply packet indicating the status of said  
8    plurality of point-to-point sessions; and

9       means for sending said aggregated reply packet to said peer aggregation device,  
10      wherein said means for examining, said means for determining, said means for  
11      generating and said means for sending are implemented in said aggregation device  
12      implemented as a single device.

1       Claim 26 (Original) The aggregation device of claim 25, wherein said means for  
2    determining comprises means for accessing a local status table which contains the status  
3    information of at least some of said plurality of point-to-point sessions.

1       Claim 27 (Original) The aggregation device of claim 25, wherein said means for  
2    generating includes a client magic number associated with each of said plurality of point-  
3    to-point sessions.

1       Claim 28 (Original) The aggregation device of claim 25, wherein said means for  
2    generating sets a bit in said aggregated reply packet to one logical value to indicate that a  
3    corresponding one of said plurality of sessions is OK/alive, and to another logical value to  
4    indicate that said corresponding one of said plurality of session not OK/alive.

1       Claim 29 (Original) The aggregation device of claim 25, wherein said aggregation  
2    device comprises one of a network access server (NAS) and a home gateway implemented  
3    in a communication network.

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1           Claim 30 (Original) An aggregation device for processing an aggregated request  
2    packet, wherein said aggregated request packet indicates that the status of a plurality of  
3    point-to-point sessions are requested, said aggregation device comprising:

4           an input interface receiving said aggregated request packet;

5           a de-encapsulator examining said aggregated request packet to determine that said  
6    aggregated request packet relates to requesting the status of point-to-point sessions;

7           a reply generator determining the status of each of said plurality of point-to-point  
8    sessions, and generating an aggregated reply packet indicating the status of said plurality  
9    of point-to-point sessions; and

10          an output interface sending said aggregated reply packet to said peer aggregation  
11   device,

12          wherein said input interface, said de-encapsulator, said reply generator and said  
13   output interface are contained in said aggregation device implemented as a single device.

1           Claim 31 (Original) The aggregation device of claim 30, further comprising a local  
2    status table storing the status information of at least some of said plurality of point-to-point  
3    sessions, wherein said reply generator determines the status of said at least some of said  
4    plurality of point-to-point sessions by accessing said local status table.

1           Claim 32 (Original) The aggregation device of claim 31, further comprising a  
2    session manager updating the status of said plurality of point-to-point sessions in said local  
3    status table.

1           Claim 33 (Original) The aggregation device of claim 30, wherein said reply  
2    generator includes in said aggregated reply packet a client magic number associated with  
3    each of said plurality of point-to-point sessions.

1           Claim 34 (Original) The aggregation device of claim 30, wherein said reply  
2    generator sets a bit in said aggregated reply packet to one logical value to indicate that a

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3 corresponding one of said plurality of sessions is OK/alive, and to another logical value to  
4 indicate that said corresponding one of said plurality of session not OK/alive.

1       Claim 35 (Original) The aggregation device of claim 30, further comprising a keep-  
2 alive processor coupled to said de-encapsulator, wherein said keep-alive processor  
3 examines said aggregated request packet to determine that status of point-to-point sessions  
4 is requested and causes said reply generator to generate said aggregated reply packet.

1       Claim 36 (Original) The aggregation device of claim 30, wherein said aggregation  
2 device comprises one of a network access server (NAS) and a home gateway implemented  
3 in a communication network.

1       Claim 37 (Currently Amended): A computer-readable medium carrying one or more  
2 sequences of instructions for causing a aggregation device to process a plurality of keep-  
3 alive messages generated by a corresponding plurality of end systems, each of said  
4 plurality of keep-alive messages being designed to request the status of a corresponding  
5 point to point (PPP) session implemented on a communication network, wherein execution  
6 of said one or more sequences of instructions by one or more processors contained in said  
7 aggregation device causes said one or more processors to perform the actions of:

8           receiving in an aggregation device said plurality of keep-alive messages;

9           generating in said aggregation device an aggregated request packet which indicates  
10 that the status of said PPP sessions is requested; and

11          sending said aggregated request packet on said communication network to a peer  
12 aggregation device,

13          wherein said receiving, said generating and said sending are performed in an  
14 aggregation device implemented as a single device.

1       Claim 38 (Original): The computer-readable medium of claim 37, further  
2 comprising:

3           receiving said aggregated request packet in said peer aggregation device;

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4 indicating the status of said plurality of sessions in an aggregated reply packet; and  
5 sending said aggregated reply packet to said aggregation device.

1 Claim 39 (Original): The computer-readable medium of claim 37, further  
2 comprising receiving in said aggregation device an aggregated reply packet from said peer  
3 aggregation device, wherein said aggregated reply packet indicates the status of at least  
4 some of said plurality of PPP sessions.

1 Claim 40 (Original): The computer-readable medium of claim 39, further  
2 comprising sending a proxy keep-alive reply message to one of said plurality of end  
3 systems originating a corresponding one of said keep alive-messages without waiting for  
4 said aggregated reply packet.

1 Claim 41 (Original): The computer-readable medium of claim 40, further  
2 comprising:

3 maintaining a remote status table in said aggregation device, wherein said remote  
4 status table indicates the status of sessions supported by said aggregation device;

5 updating said remote status table with the information in said aggregated reply  
6 packet; and generating said proxy keep-alive reply according to said remote status table.

1 Claim 42 (Currently Amended): A computer-readable medium carrying one or more  
2 sequences of instructions for causing an aggregation device to process an aggregated  
3 request packet, wherein said aggregated request packet indicates that the status of a  
4 plurality of point-to-point sessions are requested, wherein execution of said one or more  
5 sequences of instructions by one or more processors contained in said aggregation device  
6 causes said one or more processors to perform the actions of:

7 examining said aggregated request packet to determine said plurality of point-to-  
8 point sessions;

9 determining the status of each of said plurality of point-to-point sessions;

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10 generating an aggregated reply packet indicating the status of said plurality of point-  
11 to-point sessions; and  
12 sending said aggregated reply packet to said peer aggregation device,  
13 wherein said examining, said determining, said generating and said sending are  
14 performed in said aggregation device implemented as a single device.

1 Claim 43 (Original): The computer-readable medium of claim 42, wherein said  
2 determining comprises accessing a local status table which contains the status information  
3 of at least some of said plurality of point-to-point sessions.

1 Claim 44 (Original): The computer-readable medium of claim 42, wherein said  
2 generating comprises including a client magic number associated with each of said  
3 plurality of point-to-point sessions.

1 Claim 45 (Original): The computer-readable medium of claim 42, wherein said  
2 generating comprises setting a bit to one logical value to indicate that a corresponding one  
3 of said plurality of sessions is OK/alive, and to another logical value to indicate that said  
4 corresponding one of said plurality of session not OK/alive.

1 Claim 46 (Original) The computer-readable medium of claim 42, wherein said  
2 aggregation device comprises one of a network access server (NAS) and a home gateway  
3 implemented in a communication network.

1 Claim 47 (Original): A communication network comprising:  
2 a first aggregation device receiving a plurality of keep-alive messages generated by  
3 a corresponding plurality of end systems, each of said plurality of keep-alive messages  
4 being designed to request the status of a corresponding point to point (PPP) session  
5 implemented on said communication network, said first aggregation device generating an  
6 aggregated request packet which indicates that the status of said PPP sessions is requested,  
7 and sending said aggregated request packet; and

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8           a peer aggregation device receiving said aggregated request packet and indicating  
9       the status of said plurality of sessions in an aggregated reply packet, said peer aggregation  
10      packet sending said aggregated reply packet to said first aggregation device,

11           wherein each of said first aggregation device and said peer aggregation device is  
12       implemented as a single device.

1           Claim 48 (Original): The communication network of claim 47, wherein said first  
2       aggregation device is located at an edge of said communication networks.

1           Claim 49 (Original): The communication network of claim 48, further comprising  
2       an access network coupling said first aggregation device to said corresponding plurality  
3       of end systems, wherein said plurality of keep-alive messages are received on said access  
4       network.

1           Claim 50 (Original): The communication network of claim 49, wherein said first  
2       aggregation device and said peer aggregation device respectively comprise a network  
3       access server (NAS) and a home gateway.

1           Claim 51 - 58 (Canceled):

1           Claim 59 (Original): The method of claim 1, wherein said aggregation device is  
2       physically separate from said plurality of end systems.

1           60. (Original) The method of claim 10, wherein said aggregation device is  
2       physically separate from said plurality of end systems.

1           Claim 61 - 66 (Canceled)

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1       Claim\_67(New): The method of claim 1, wherein said generating includes less data  
2       in said aggregated request packet than the data forming said plurality of keep-alive messages  
3       together.

1       Claim 68 (New): The method of claim 67, wherein each of said plurality of keep-alive  
2       messages contains an identifier of a corresponding PPP session, wherein said generating  
3       comprises:

4           selecting said identifier of each of said plurality of keep-alive messages; and  
5           forming said aggregated request packet from said identifiers,  
6           whereby said aggregated request packet contains less data than said plurality of keep-  
7       alive messages together.

8       Claim 69 (New): The method of claim 1, wherein each of said PPP sessions  
9       terminates at a home gateway, and wherein said aggregation device comprises a switching  
10      device and is in the path of each of said PPP sessions from a corresponding one of said  
11      plurality of end systems to said home gateway.

1       Claim 70 (New): The aggregation device of claim 30, wherein said reply generator  
2       includes less data in said aggregated request packet than the data forming said plurality of  
3       keep-alive messages together.

1       Claim 71 (New): The aggregation device of claim 70, wherein each of said plurality  
2       of keep-alive messages contains an identifier of a corresponding PPP session, wherein said  
3       reply generator operates to:

4           select said identifier of each of said plurality of keep-alive messages; and  
5           form said aggregated request packet from said identifiers,  
6           whereby said aggregated request packet contains less data than said plurality of keep-  
7       alive messages together.

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8       Claim 72 (New): The aggregation device of claim 30, wherein each of said PPP  
9 sessions terminates at a home gateway, and wherein said aggregation device comprises a  
10 switching device and is in the path of each of said PPP sessions from a corresponding one  
11 of said plurality of end systems to said home gateway.

1       Claim 73 (New): The computer readable medium of claim 37, wherein said  
2 generating includes less data in said aggregated request packet than the data forming said  
3 plurality of keep-alive messages together.

1       Claim 74 (New): The computer readable medium of claim 73, wherein each of said  
2 plurality of keep-alive messages contains an identifier of a corresponding PPP session,  
3 wherein said generating comprises:

4             selecting said identifier of each of said plurality of keep-alive messages; and  
5             forming said aggregated request packet from said identifiers,  
6             whereby said aggregated request packet contains less data than said plurality of keep-  
7 alive messages together.

8       Claim 75 (New): The computer readable medium of claim 37, wherein each of said  
9 PPP sessions terminates at a home gateway, and wherein said aggregation device comprises  
10 a switching device and is in the path of each of said PPP sessions from a corresponding one  
11 of said plurality of end systems to said home gateway.

1       Claim 76(New): The aggregation device of claim 21, wherein said means for  
2 generating includes less data in said aggregated request packet than the data forming said  
3 plurality of keep-alive messages together.

1       Claim 77 (New): The aggregation device of claim 76 wherein each of said plurality  
2 of keep-alive messages contains an identifier of a corresponding PPP session, wherein said  
3 means for generating operates to:  
4             select said identifier of each of said plurality of keep-alive messages; and

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5 form said aggregated request packet from said identifiers,  
6 whereby said aggregated request packet contains less data than said plurality of keep-  
7 alive messages together.

8 Claim 78 (New): The aggregation device of claim 21, wherein each of said PPP  
9 sessions terminates at a home gateway, and wherein said aggregation device comprises a  
10 switching device and is in the path of each of said PPP sessions from a corresponding one  
11 of said plurality of end systems to said home gateway.